

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



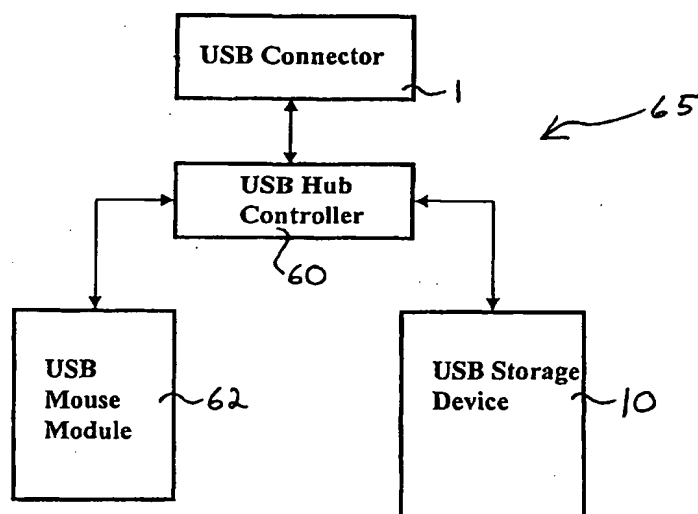
(43) International Publication Date
13 June 2002 (13.06.2002)

PCT

(10) International Publication Number
WO 02/46904 A1

- (51) International Patent Classification⁷: **G06F 3/033** (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.
- (21) International Application Number: PCT/SG00/00195
- (22) International Filing Date: 4 December 2000 (04.12.2000)
- (25) Filing Language: English
- (26) Publication Language: English (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).
- (71) Applicant (*for all designated States except US*): **TREK TECHNOLOGY (SINGAPORE) PTE LTD** [SG/SG]; 30 Loyang Way #07-13/14/15, Loyang Industrial Estate, Singapore 508769 (SG).
- (72) Inventor; and
- (75) Inventor/Applicant (*for US only*): **CHENG, Chong, Seng** [SG/SG]; 129 Loyang Rise, Singapore 507472 (SG).
- (74) Agent: **MCCALLUM, Graeme, David**; Lloyd Wise, Tanjong Pagar, P.O. Box 636, Singapore 910816 (SG).
- Published:
— with international search report
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

(54) Title: A COMPUTER POINTING DEVICE



(57) Abstract: A computer device (65) has a coupling device (1) for coupling to a computer serial bus. A primary control device (60) is coupled to the coupling device (1). A computer pointing mechanism (62) is coupled to the primary control device (60) and a data storage device (10) is coupled to the primary control device (60). The primary control device (60) controls data flow between the coupling device (1) and each of the computer pointing mechanism (62) and the data storage device (10). The data storage device (10) includes an interface device (2) coupled to the primary control device (60), a memory control device (3) and a non-volatile solid-state memory device (4). The memory control device (3) being coupled between the interface device (2) and the memory device (4) to control the flow of data from the memory device (4) to the interface device (2).

WO 02/46904 A1

Best Available Copy

A Computer Pointing Device

The invention relates to a computer pointing device.

5 Conventional computer pointing devices generally perform only one function. That is, to enable a user to point to data or information, select an action or perform commands on a computer by interacting with a display device also connected to the computer.

10 In addition, there is now a number of different devices that also require to be connected to the computer such as external memory drives and other peripherals. Therefore, it is becoming necessary to have more and more connections for the various peripheral items.

15 In accordance with the present invention, there is provided a computer pointing device comprising a coupling device for coupling to a computer serial bus, a primary control device coupled to the coupling device, a computer pointing mechanism coupled to the primary control device and a data storage device coupled to the primary control device, the primary control device controlling data
20 flow between the coupling device and each of the computer pointing mechanism and the data storage device; the data storage device comprising an interface device coupled to the primary control device, a memory control device and a non-volatile solid-state memory device, the memory control device being coupled between the interface device and the memory device to control the flow
25 of data from the memory device to interface device.

An advantage of the invention is that by providing a computer pointing device including a data storage device, the computer pointing device can be used as both a computer pointing device and a data storage device. In addition, there is
5 also the advantage that, as the data storage device comprises a non-volatile solid-state memory device, it is possible to provide a data storage device which may be coupled to a computer having a serial bus port and which does not include moving parts or require a mechanical drive mechanism to read the data from the data storage device.

10

Preferably, the data storage device is located wholly within a housing of the computer pointing device, and is typically, not removable from the computer pointing device.

15 Preferably, the data storage device receives and outputs data in the same format as the computer serial bus to which the computer pointing device is intended to be coupled.

Preferably, the computer pointing mechanism comprises a conventional
20 computer mouse mechanism.

Preferably, the non-volatile solid-state memory device is a read/write memory device, such as a flash memory device or an electrically erasable programmable read only memory device (EEPROM).

25

Preferably, where the memory device is a read/write memory device, the memory control device controls the flow of data to and from the memory device.

Typically, the computer pointing device further comprises a manually operated
5 switch movable between a first position in which writing of data to the memory device is enabled, and a second position in which writing of data to the memory device is prevented.

Preferably, the memory control device may include a read only memory, that
10 stores a program to control the operation of the memory control device.

Preferably, the memory control device is a micro-controller.

Typically, the interface device comprises a universal serial bus (USB) driver to convert data between a USB format and a PC format, and the coupling device
15 comprises a USB coupling device.

Alternatively, the interface device comprises a driver for IEEE 1394 (Firewire) protocol, and the coupling device comprises a Firewire coupling device.

20 An example of a computer pointing device in accordance with the invention will now be described with reference to the accompanying drawings, in which:

Figure 1 is a block diagram of a computer pointing device including a data storage device;

25 Figure 2 is a schematic block diagram of the data storage device;

Figure 3 is a flow diagram showing the initial setup of the data storage device by a software supplier;

Figure 4 is a flow diagram showing the initial setup of the data storage device by an end user;

5 Figure 5 is a flow diagram illustrating the operation of the computer pointing device; and

Figure 6 is a flow diagram showing operation of the data storage device.

Figure 1 is a block diagram showing a computer mouse 65. The mouse 65
10 includes a USB connector 1 that is coupled to a USB hub controller 60. The USB hub controller 60 is also coupled to an output 61 from a conventional computer mouse mechanism 62 and to a data storage device 10 that is mounted within the housing of the mouse 65. Hence, the external appearance of the mouse 65 is similar or identical to a conventional computer mouse.

15

Figure 2 shows in more detail the data storage device 10 that is coupled to the USB hub controller 60. The data storage device 10 comprises a USB interface device 2 that is coupled to the USB hub controller 60. The USB interface device 2 is also coupled to a micro-controller 3 that is coupled to a flash
20 memory 4. The micro-controller 3 includes a read only memory (ROM) 5 that stores a program to control the operation of the micro-controller 3.

The operations performed by the micro-controller 3 include comparing passwords entered by a user with a corresponding password stored in the flash
25 memory 4 to determine whether the user is authorised to access the contents of

the flash memory 4. The program stored in the ROM 5 also controls the data flow to and from the flash memory 4 and can also detect whether the computer to which the memory device 1 is coupled has installed software programs that correspond to passwords stored in the flash memory 4. The micro-controller 3
5 can automatically retrieve passwords from the installed software to compare with passwords stored in the flash memory to verify that a user of the computer is authorised to access and run the software. In addition, the program stored in the ROM 5 also permits the setting of a password in the flash memory by a software supplier to correspond to the password contained in software supplied
10 to a user. Typically, the password may correspond to the serial number of the software.

The flash memory 4 is typically divided into a number of different sections or zones. Typically, the flash memory is divided into two zones and each zone
15 has a unique password. If the data storage device 10 is supplied with packaged software, the software serial number can be set in one zone to be the password to permit a user to access and use the software. The other zone, which can be used typically for storing a user's data, may have a separate password that is set by the user. Typically, the passwords are stored in a secure location of the
20 flash memory in an encrypted form. The encryption, decryption, data flow control and USB protocol are all managed by the micro-controller 3.

The micro-controller 3 also includes a random access memory (RAM) 6 which is a temporary storage area to permit functioning of the micro-controller 3. In
25 addition, a manual switch 7 is coupled between the flash memory 4 and the

micro-controller 3. The manual switch 7 is located on the external surface of the mouse 65 and is movable between a first position, in which a user may write data to the flash memory 4, and a second position, in which data is prevented from being written to the flash memory 4.

5

The mouse 65 may also include a USB socket (not shown) that is coupled directly to the USB connector 1 and permits other USB devices to be coupled to the USB via the mouse 65. For example, if a user wishes to increase memory space, a USB connector of a second memory device 10 may be connected to the USB socket.

10

Figure 3 is a flow diagram showing the set up procedure for the device 10 for a software supplier when the software supplier intends to supply the mouse 65 as an authentication device for the software. Firstly, the connector 1 is plugged into 20 a USB socket on a computer. After the mouse 65 has been plugged into the USB socket on the computer, a communication is established 21 between the computer and the device 10. The software supplier has pre-installed installation software on the computer which is run by the operator. From the pre-installed software, the operator selects password set up installation 22, in response to which the pre-installed software requests the operator to enter a password or serial number corresponding to the software with which the device 10 is to be supplied. The password or serial number is then encrypted 26 and stored 27 in the flash memory 4.

20

Figure 4 is a flow diagram showing the initial set-up of a password for zone 2 of the flash memory 4 by an end user. The mouse 65 is typically supplied with driver software for the device 10 that is loaded by the user onto the computer prior to set-up of the device 10. To set-up the password for zone 2 the user
5 plugs in 20 the mouse 65 into a USB port on the computer and communication 21 is established between the computer and the device 10. The user then runs the driver software and the driver software enters a password installation set-up mode 23 for zone 2. The user then enters 28 a password that they wish to use to prevent unauthorised access to zone 2 of the flash memory 4. The password
10 entered is then encrypted 29 and stored 30 in the flash memory 4.

After an end user has performed the initial password set up procedure described above and shown in Figure 4, when a user plugs in 20 the mouse 65 to a USB port on a computer, the computer will establish a communication 21
15 with the mouse mechanism 62 and the device 10, as shown in Figure 5. When the communication with the device 10 is established, the computer first checks 33 an installation status flag stored in the flash memory 4 (see Figure 6). If the status flag is "Y", the device 10 outputs 34 an "OK" flag to the computer. The micro-controller 3 then instructs the computer to issue a request 35 to the user
20 to select the zone that they wish to enter. If the status flag is "N", the device does not output an "OK" flag to the computer, and goes straight to step 35. In response to the request 35 for zone selection, the user selects 36 either zone 1 or zone 2.

If zone 1 is selected, the device 10 assumes that the user wishes to install software on the computer that is stored in the flash memory 4 and requests 37 the appropriate password for confirmation that the user is authorised to install the software. The micro-controller 3 receives the password entered by the user, s retrieves the zone 1 password stored in the flash memory 4, decrypts the zone 1 password and compares it with the password entered by the user to authenticate 38 whether the user is authorised to install the software. If the passwords do not match, the device 10 prompts the computer to request 37 the user to enter the password again.

10

If the password entered by the user matches the password stored in the flash memory 4, the micro-controller 3 starts 39 the software installation from the flash memory 4 to the computer. In order to install software, the computer sends 40 a read/write command in USB format to the micro-controller 3 for 15 data, the micro-controller 3 retrieves the requested data from the flash memory 4, converts the data to a PC format compatible with the operating system of the computer. For example, this may be FAT 16 or FAT 32 format. The micro-controller 3 then sends 41 the data to the interface device 2. The device 2 converts 42 the data to USB format and outputs the data to the computer 20 through the USB hub controller 60 and connector 1. The micro-controller 3 then checks 43 whether the software installation is complete. If the operation is not complete, the operation returns to step 40. If the installation of the software is complete, the status flag stored in the flash memory 4 is changed to "Y".

If a user selects zone 2, the micro-controller 3 sends a command to the computer to request 46 the user to enter the password for zone 2. When the user enters the password, the computer sends the password to the micro-controller 3. The micro-controller 3 retrieves the password for zone 2 from the flash memory 4, decrypts 47 the password and compares it with the password entered by the user. If the password entered by the user is incorrect, the operation returns to step 46 and the computer requests 46 the user for the password again.

10 If the password entered by the user is correct, the user has access to zone 2 of the flash memory 4 to read data from the flash memory 4 and to write data to the flash memory 4. However, data can only be written to the flash memory 4 if the manual switch 7 is in the position to permit data to be written to the flash memory 4. In order to read or write data from or to the flash memory 4 a read or write command is sent 48 by the computer using USB protocol to the micro-controller 3. In response to a read command the micro-controller 3 retrieves 49 data from the flash memory 4, converts the data to a PC format compatible with the computer operating system, such as FAT 16 or FAT 32. The micro-controller then sends the data to the interface device 2 for conversion 50 to USB format and then output to the computer. In response to write command, 20 the micro-controller receives data from the interface device 2 to write to the flash memory 4.

The micro-controller 3 then determines 51 whether the read or write operation is complete. If the operation is not complete it returns to step 48. If the operation is complete the operation terminates 52.

- 5 While the computer is reading/writing to the data storage device 10, the mouse 65 can be used as a conventional computer mouse by a user and the USB hub controller 60 acts as a multiplexer to control task switching between the mouse mechanism 62 and the data storage device 10.
- 10 The mouse 65 described above is for coupling to a universal serial bus (USB). However, the connector 1, the USB hub controller 60, the interface device 2 and socket 8 could be for use with any suitable computer serial bus. For example, the device 10 could be modified for use with IEEE 1394 (Firewire) protocol by substituting the USB connector 1, USB hub controller 60, USB interface device
- 15 2 and USB socket 8 with a Firewire protocol compatible plug, hub controller, interface device and socket respectively.

An advantage of the mouse 65 described above is that it combines a computer pointing mechanism with a data storage device. This is especially useful with a

20 laptop, notebook or other portable computer where the number of serial ports, and especially USB ports, is limited. In addition the mouse 65 by its very nature is portable and the data storage device does not require a mechanically operated reading/writing device.

CLAIMS

1. A computer pointing device comprising a coupling device for coupling to a computer serial bus, a primary control device coupled to the coupling device, a computer pointing mechanism coupled to the primary control device and a data storage device coupled directly to the primary control device, the primary control device controlling data flow between the coupling device and each of the computer pointing mechanism and the data storage device; the data storage device comprising an interface device coupled to the primary control device, a memory control device and a non-volatile solid-state memory device, the memory control device being coupled between the interface device and the memory device to control the flow of data from the memory device to the interface device.
2. A device according to claim 1, wherein the data storage device is located wholly within a housing of the computer pointing device.
3. A device according to claim 1 or claim 2, wherein the data storage device is not removable from the computer pointing device.
4. A device according to any of the preceding claims, wherein the data storage device receives and outputs data in the same format as the computer serial bus to which the computer pointing device is to be coupled.
5. A device according to any of the preceding claims, wherein the computer pointing mechanism is a computer mouse mechanism.

6. A device according to any of the preceding claims, wherein the non-volatile solid-state memory device is a read/write memory device.

5 7. A device according to claim 6, wherein the read/write memory device is a flash memory device.

8. A device according to claim 6 or claim 7, wherein the memory control device controls the flow of data to and from the memory device.

10

9. A device according to any of claims 6 to 8, further comprising a manually operated switch movable between a first position in which writing of data to the memory device is enabled, and a second position in which writing of data to the memory device is prevented.

15

10. A device according to any of the preceding claims, wherein the memory control device comprises a micro-controller.

11. A device according to any of the preceding claims, wherein the coupling
20 device comprises a universal serial bus (USB) coupling device and the interface device comprises a USB driver.

12. A device according to any of the preceding claims, wherein the coupling
device comprises an IEEE 1394 (Firewire) protocol coupling device and the
25 interface device is a Firewire protocol driver.

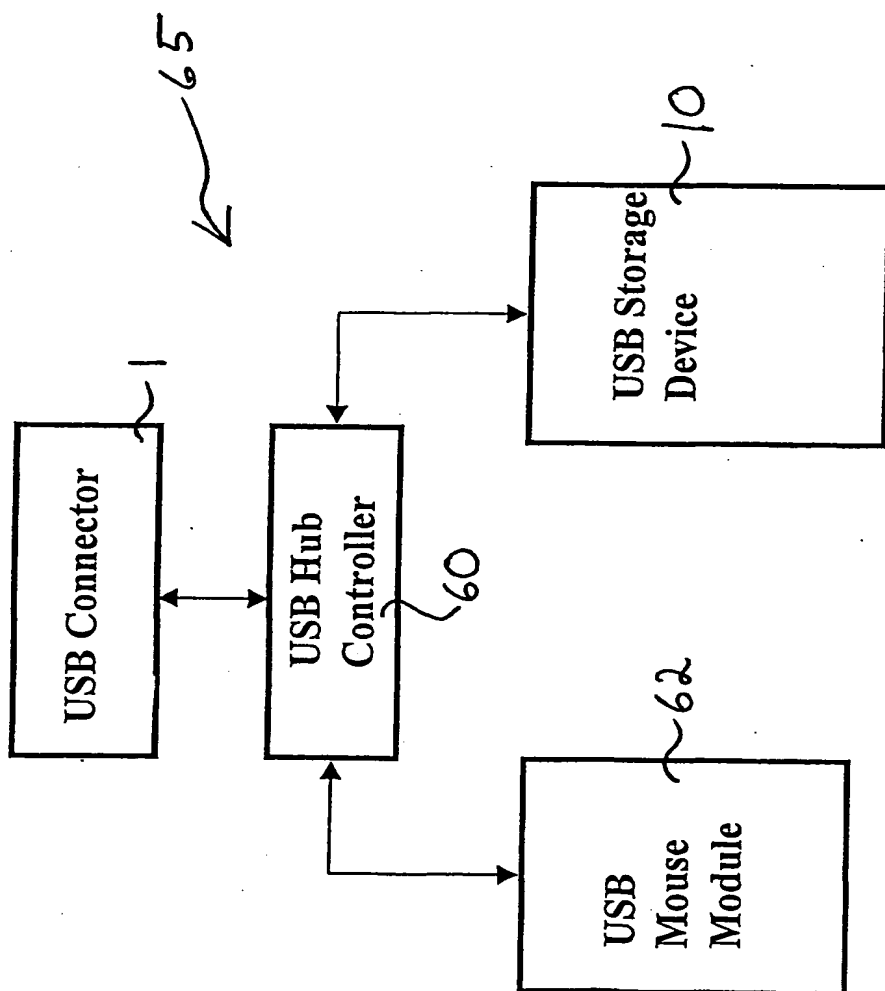


Figure 1

2/5

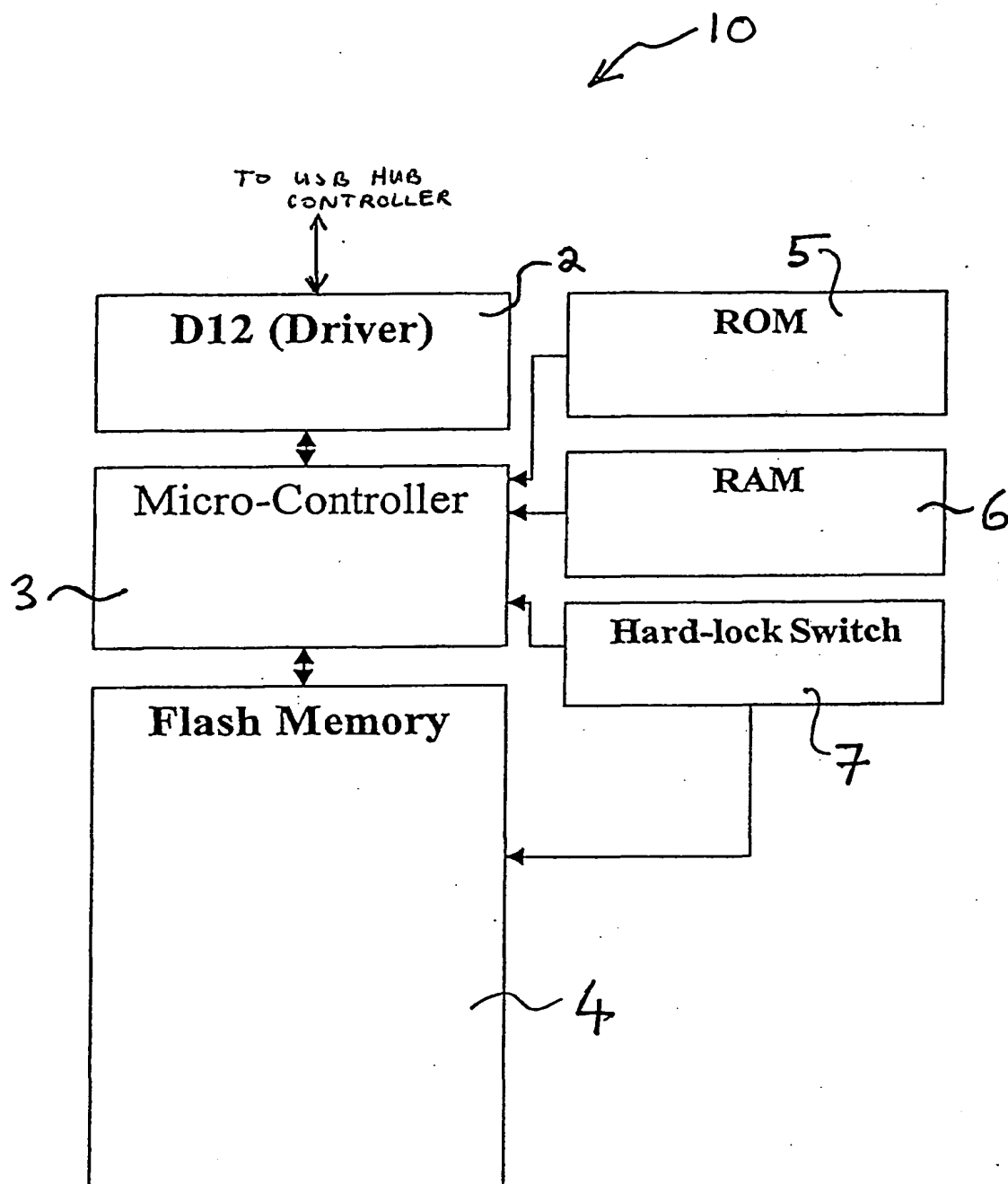


Figure 2

3/5

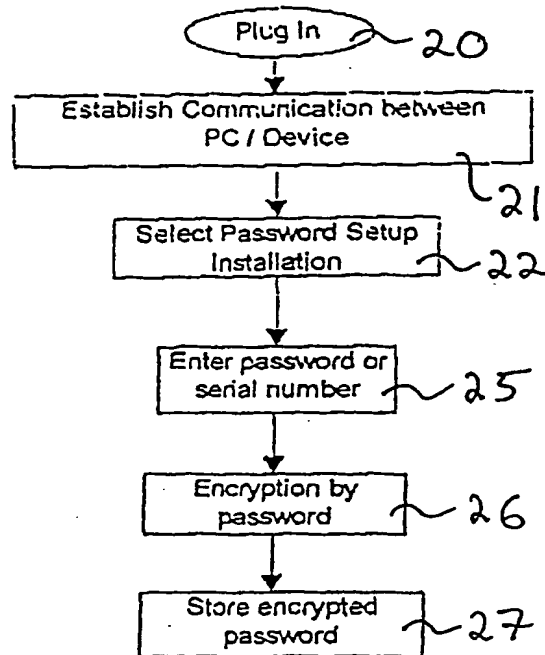


Figure 3

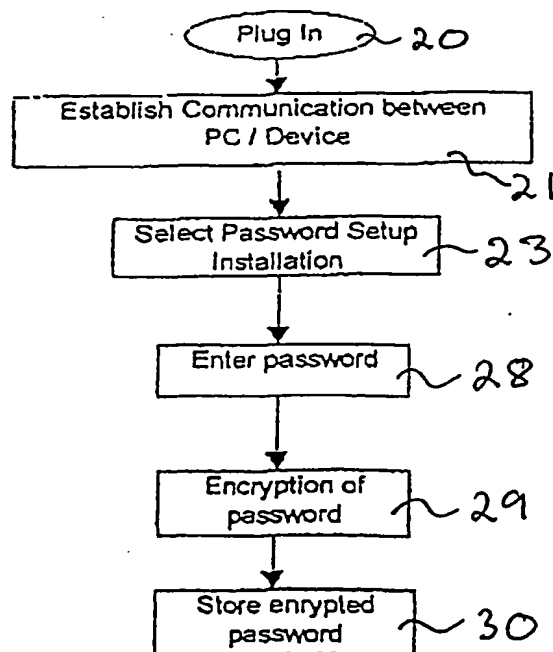


Figure 4

4/5

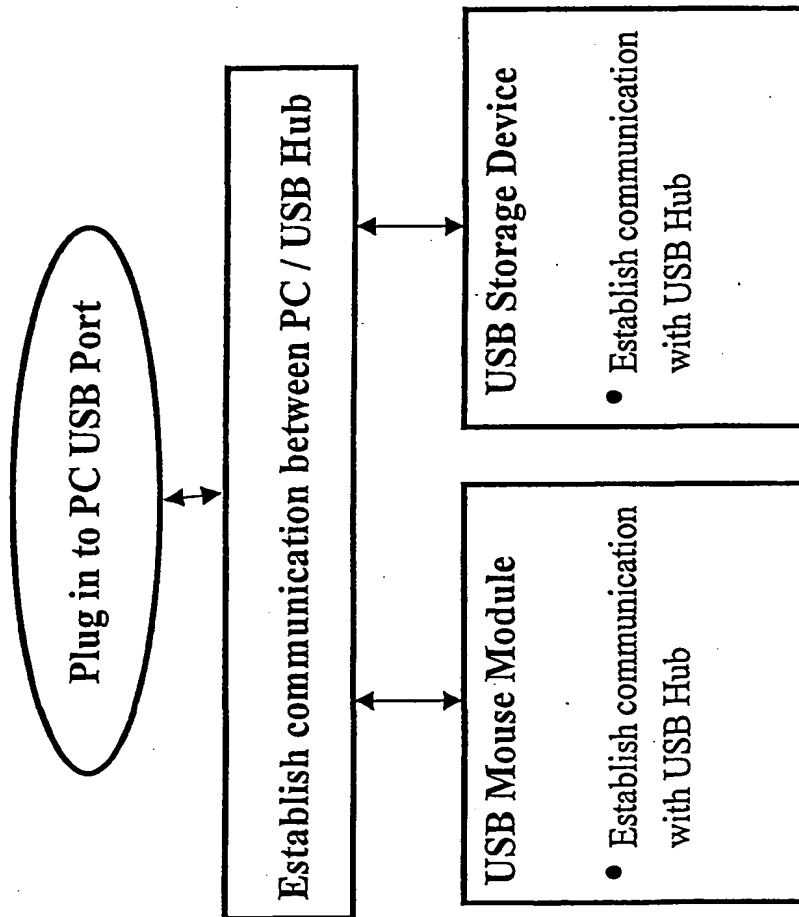


Figure 5

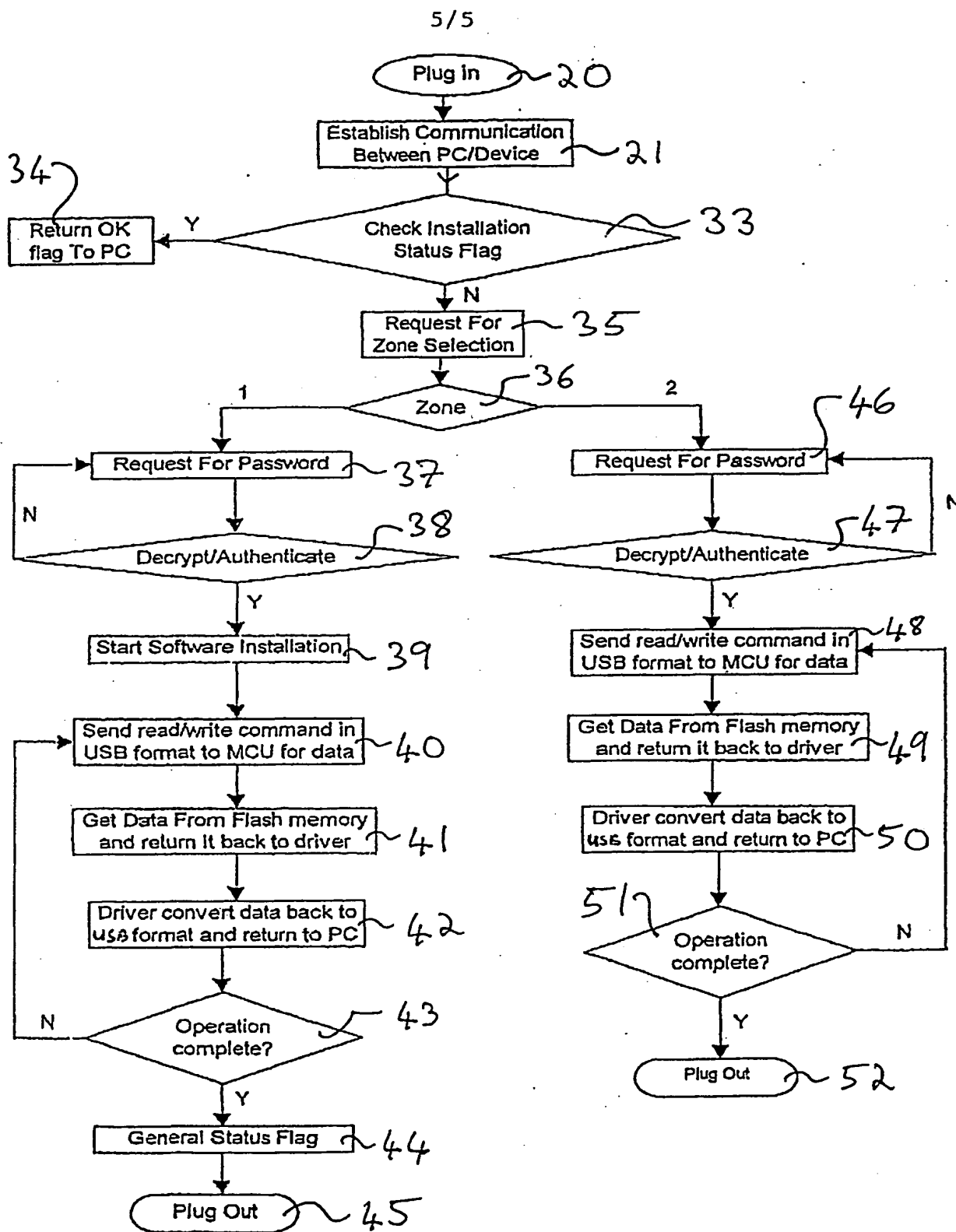


Figure 6

INTERNATIONAL SEARCH REPORT

International Application No.
PCT/SC 00/00195

CLASSIFICATION OF SUBJECT MATTER

IPC⁷: G06F 3/033

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC⁷: G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0703544 A (IBM) 27 March 1996 (27.03.96) <i>claim 1, 2, fig. 1.</i>	1-4, 6
A	US 5646646 A (CANON) 8 July 1997 (08.07.97) <i>claim 1, fig. 4, 5, 6.</i>	1
A	US 5490096 A (Tokyo Shibaura) 6 February 1996 (06.02.96) <i>claim 1, 14; fig. 1.</i>	1
A	US 5583538 A (Canon) 10 December 1996 (10.12.96) <i>claim 1, fig. 1.</i>	1

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

„A“ document defining the general state of the art which is not considered to be of particular relevance

„E“ earlier application or patent but published on or after the international filing date

„I“ document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

„O“ document referring to an oral disclosure, use, exhibition or other means

„P“ document published prior to the international filing date but later than the priority date claimed

„T“ later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

„X“ document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

„Y“ document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

„&“ document member of the same patent family

Date of the actual completion of the international search

4 July 2001 (04.07.2001)

Date of mailing of the international search report

16 August 2001 (16.08.2001)

Name and mailing address of the ISA/AT

Austrian Patent Office

Kohlmarkt 8-10; A-1014 Vienna

Facsimile No. 1/53424/535

Authorized officer

MIHATSEK

Telephone No. 1/53424/329

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

P/SG 00/00195

Patent document cited in search report			Publication date	Patent family member(s)		Publication date	
EP	A1	703544	27-03-1996	JP	A2	8076920	22-03-1996
				US	A	6137476	24-10-2000
				US	A	5923757	13-07-1999
				US	A	5930368	27-07-1999
				US	A	6067076	23-05-2000
				US	A	6072468	06-06-2000
				JP	A2	11150547	02-06-1999
US	A	5490096	06-02-1996	CN	A	1081008	19-01-1994
				CN	B	1058578	15-11-2000
				JP	A2	6004351	14-01-1994
US	A	5583538	10-12-1996	JP	A2	61088328	06-05-1996
				JP	B4	3013593	22-02-1991
US	A	5646646	08-07-1997	AT	E	139642	15-07-1996
				AT	E	179540	15-05-1999
				AU	A1	41757/89	09-08-1990
				AU	B2	617006	14-11-1991
				DE	C0	68926704	25-07-1996
				DE	T2	68926704	09-01-1997
				DE	C0	68928983	02-06-1999
				DE	T2	68928983	16-12-1999
				EP	A2	361471	04-04-1990
				EP	A3	361471	27-01-1993
				EP	A2	706166	10-04-1996
				EP	A2	706167	10-04-1996
				EP	B1	361471	19-06-1996
				EP	A3	706166	11-09-1996
				EP	A3	706167	20-11-1996
				EP	B1	706166	28-04-1999
				JP	A2	2093491	04-04-1990
				JP	B2	2801218	21-09-1998
				KR	B1	9205329	02-07-1992
				US	A	5345250	06-09-1994
				US	A	5359344	25-10-1994
				US	A	5543817	06-08-1996
				US	A	5574476	12-11-1996
				US	A	5657042	12-08-1997
				US	A	5677706	14-10-1997
				US	A	5784043	21-07-1998
				US	A	5818410	06-10-1998
				JP	A2	2093583	04-04-1990
				JP	B2	2738845	08-04-1998
				JP	A2	2093584	04-04-1990
				JP	B2	2738846	08-04-1998
				JP	A2	2099991	11-04-1990
				JP	B2	2770961	02-07-1998
				JP	A2	2101495	13-04-1990
				JP	B2	2662427	15-10-1997
				JP	A2	2103094	16-04-1990
				JP	B2	2714053	16-02-1998

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☒ FADED TEXT OR DRAWING
- ☐ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☐ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☐ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.